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(54) **Method and apparatus for composting organic matters having high water content**

Verfahren und Vorrichtung zur Kompostierung von mit hohem Wassergehalt organischen Materialien

Procédé et appareil de compostage de matériaux organiques à haute teneur en eau

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- **DATABASE WPI Section Ch, Week 9537 Derwent Publications Ltd., London, GB; Class D16, AN 95-282423 XP002009647 & TW-A-251 278 (KANKYO KOGAKU KENKYUSHO KK) , 11 July 1995**
- **PATENT ABSTRACTS OF JAPAN vol. 95, no. 007 & JP-A-07 171546 (KANKYO KOGAKU KENKYUSHO:KK), 11 July 1995,**

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Description

[0001] The present invention relates to a method and an apparatus for drying, decomposing and composting organic matters containing a large amount of water such as garbage, sludge and the like.

[0002] It is desirable that organic waste containing water such as garbage and the like is utilized as a soil improving agent after decomposing, drying and composting it at a place of its generation, and reducing its volume and weight.

[0003] Especially it is recently desired to make utilization after composting as far as possible without depending on a self-governing community or the like upon treatment of garbage generated from food processing factories, cookhouses of restaurants, kitchens of homes and the like.

Composters are known, eg see:

EP-A-476217, discloses a process for composting organic wastes such as kitchen waste or similar by mixing and grinding and further decomposing the heated mixture under mesophyllic and thermophilic conditions. This document further discloses an apparatus comprising a treatment tank having a jacket provided with a heating medium, air-tight introduction and take out ports, a stirrer, ventilation and exhaust means and units for controlling the heating medium and rotary vane.

JP-A-7171546 discloses a similar apparatus comprising a treatment tank having a heat medium jacket, air-tight introduction and takeout ports, ventilation and exhaust tubes, a unit for circulating and controlling the heat medium, a rotary vane and a unit for rotating it.

EP-A-641753 discloses an apparatus having a feature close to the previous one to be used for fermentation treatment.

All three of the above apparatuses have the container of the material to be treated in the form of a horizontal elongated container having inside it a grinding and mixing rotor with horizontal rotation axis. In particular the EP-A-476217 container has a horizontal cylinder shape, whereas JP-A-7171546 and EP-A-641753 have a semicylindrical shape (U-section shape), all with the horizontal rotating drum inside, for mixing and grinding the material during treatment.

[0004] However, in the case of conventionally known composters for domestic use, troubles occurred in the fermentation treatment when waste to be treated has mixed with those which cannot be composted easily such as wooden waste such as toothpicks, disposable wooden chopsticks and the like, metal waste such as aluminum foils and the like, disposable tableware made of plastic, waste such as small bags, films and the like, shells, egg shells, bones and the like, so that it is necessary to remove them beforehand, and it takes a long time to ferment organic matters, as well as organic matters such as garbage containing a large amount of water from 80 % and around 95 % in weight ratio can not be fermented conveniently as they were.

Therefore, when they are to be composted, in order to adjust their water-containing amounts to be around 65 %, it has been necessary to mix from 40 % of water content adjusting materials such as dried soil, dried grass, straw, rice bran, sheets of newspaper, sawdust and the like so as to provide a state in which the surface was dry, after which fermentation microorganisms are added.

[0005] However, such preselection of waste is difficult to be performed, and especially recently it has become impossible to obtain the water content adjusting materials as described above. In addition, such mixing of the water content adjusting materials results in increase of the weight of garbage which should have been principally reduced in weight as far as possible.

[0006] In addition, fermentation is slow in such water content adjusting materials, and it takes several years to make composts, so that when they are used in a paddy field and the like the problems are that they float, are lost in flow and plug water passages.

[0007] Further, in the case of those of a type of natural fermentation utilizing fermentation microorganisms, the problem appears that in addition to the treatment requiring a long time period, temperature management and changeover are difficult, and treatment of fishery products which generate strong offensive odors is especially difficult in urban places.

[0008] Furthermore, a rotary kiln of a hot wind drying type, which is used in Europe and the like, is not suitable for Japanese garbage having a high water content, because it is necessary to mix a large amount of water content adjusting material as described above, treatment of leftover food and the like is difficult, and further because in a hot wind drying type, there are problems that there is much loss of heat and heat efficiency is low, and further there is such a drawback that animal waste such as fishery products and the like generates strong offensive odor during the treatment.

[0009] The present invention has been made in order to solve the aforementioned problems, an object of which is to provide a method and an apparatus capable of making a compost in such a manner that; garbage having a high water content from 80 % and somewhat mixed with bones, shells, disposable wooden chopsticks, disposable lunch boxes and the like which can not be fermented can be efficiently dried, an offensive odor generated at that time is completely treated, aerobic bacteria adhering to the waste are activated to perform fermentation efficiently, and drying, decomposition and sterilization of garbage can be completed within a short time period of about 12 hours.

[0010] Thus, foreign matters difficult for fermentation as described above become brittle, and are finely ground, dried and contracted during treatment steps in accordance with the method of the present invention.

[0011] The aforementioned object can be achieved by composting organic matters having a high water content by means of a treatment method comprising:

a fermentation and decomposition step in which organic matters containing a large amount of water is held in a treatment tank under supply of air for from one hour to three hours at a temperature from room temperature to 60°C while heating, agitating and grinding them to make them into a rice porridge state and to have them perform an aerobic fermentation, and generated gas and water vapor are extracted to the outside of the treatment tank to perform dehydration and drying of the product into a water content of not more than 65 %;
a thermal fermentation and decomposition step in which the temperature of a fermentation and decomposition product is held from one hour to six hours at a temperature from 60°C to 100°C to thermally ferment and decompose the fermentation and decomposition product, and generated gas and water vapor are extracted to the outside of the treatment tank to perform dehydration and drying of the product into a water content of not more than 45 %; and
a final drying step in which a temperature of a thermal decomposition product is held from one hour to six hours at a temperature from 100°C to 135°C to perform sterilization, and generated gas and water vapor are extracted to the outside of the treatment tank to perform dehydration and drying of the product into a water content of not more than 30 %.

[0012] During this treatment time period, the temperature of the material to be treated is automatically controlled in accordance with the drying speed and the water content.

[0013] Then, when a raw material containing heavy metal components is treated by this treatment method, it is recommended that caustic lime from 8 % to 12 % in weight % with respect to the dry weight is added to the organic matters to be treated and are subjected to an agitation treatment at a temperature from 70°C to 90°C for 15 minutes to one hour, then a known sulfide is added to perform a stabilization treatment of heavy metal, beforehand.

[0014] Further, the aforementioned composting treatment method can be conducted by a composting apparatus comprising:

a treatment tank having a heat medium jacket provided to cover a main body portion, an introduction port for organic matters to be treated, a lid capable of closing the introduction port for organic matters in air-tight manner, a compost takeout port, a door capable of closing the compost takeout port in air-tight manner, a ventilation tube provided with a ventilation control valve and capable of introducing air into the inside of the treatment tank and an exhaust tube capable of extracting internal gas to the outside;
a unit for circulating a heat medium in the heat medium jacket of the treatment tank while sequentially controlling it in a temperature range from room temperature to 135°C in accordance with a proceeding degree of drying of contents in the treatment tank;
a rotary vane rotating in the treatment tank, grinding and agitating organic matters to be treated in the treatment tank, and capable of making the organic matters into a rice porridge state;
a unit for rotating the rotary vane units including a water tank for extracting the gas generated in the treatment tank through its exhaust tube to the outside of the treatment tank and performing a deodorization treatment to release it to atmospheric air: and a unit for controlling the operation of each of aforementioned composing elements.

[0015] In the case of the construction as described above, the matter to be dried is efficiently agitated, fermented, dehydrated and dried at a heating temperature at which no protein is decomposed, so that a compost having a good quality is obtained.

[0016] Fig. 1 is an explanatory view showing one embodiment of a composter according to the present invention.

[0017] The arm of the present invention is to provide a method and an apparatus which can perform drying, weight reduction and can compost garbages having a high water content such as, for example, vegetable waste having a water content of 90-98 % in weight, leftover food having the same of 85-95 % and the like without using any water content adjusting material for a short time period.

[0018] Thus, in the fermentation and decomposition step as the first step, organic matters containing a large amount of water are placed in the treatment tank provided with the rotary vane, which are heated to a temperature from room temperature to 60°C under supply of air while vigorously agitating and grinding them to make them into a rice porridge state and to have them perform aerobic fermentation, and generated gas and water vapor are extracted to the outside of the treatment tank to perform drying and dehydration.

[0019] The fermentation and decomposition step is continued until the water content becomes not more than 65 % depending on the amount of raw materials. The required time depends on the amount of raw materials to be treated, however, it is usually about one hour to three hours.

[0020] For this treatment step, the heat medium heated to a temperature of about 80°C to 135°C is circulated in the jacket of the treatment tank beforehand, a predetermined amount of raw material organic matters are introduced into

the treatment tank, the rotary vane in the treatment tank is rotated, and the organic matters become a rice porridge state by vigorously agitating and grinding them.

[0021] Though the temperature of the heat medium is greatly decreased, it is heated so as to be about 60°C after a predetermined time period, and have it circulate in the jacket. The temperature of the heat medium depends on season and the water content of raw materials to be treated, however, it can be experimentally determined.

[0022] During this period, generated gas and water vapor are extracted while supplying air into the treatment tank, extracted exhaust gas is guided to an absorbing tank filled with water, and released to outside air after absorbing the gas with offensive odor by washing it.

[0023] The water having absorbed various gases is supplied with ozone, chlorine and the like to decompose and clean its organic components, and they are reutilized or released to sewage.

[0024] While the temperature of organic matters rises from room temperature to 60°C, the fermentation is performed by aerobic bacteria, and simultaneously the dehydration and drying by removal of water vapor proceed.

[0025] When the water content approaches 65 %, the contents in the treatment tank gradually escapes from the rice porridge state and is solidified, beginning to become a solid state or a granular state.

[0026] If necessary, from about the time at which the water content becomes not more than 65 %, the temperature of the heat medium may be optionally increased, the temperature of a fermented and decomposed product in the treatment tank is held from 60°C to 100°C to thermally decompose the fermented and decomposed product, generated gas and water vapor are extracted to the outside of the treatment tank to proceed dehydration and drying, and the water content is lowered to about not more than 45%.

[0027] In a preferred embodiment, by taking the time from one hour to six hours, the temperature in the treatment tank is raised successively from 60°C up to 100°C.

[0028] In this step, the grinding and agitation by the rotary vane, and the extraction, decomposition and deodorization treatment of generated gas are subsequently continued.

[0029] In addition, in this step, general bacteria and fungi die, and in turn the propagation of thermophilic cellulose decomposing bacteria begins, the secondary fermentation is performed by them, and the plant fibers are decomposed. Further, the thermal decomposition is performed at the other hand.

[0030] Next, as the final step, in order to dehydrate and dry the thermally decomposed product by the aforementioned step into a water content of not more than 30 %, its temperature is held from one hour to six hours from 100°C to 135°C to perform sterilization, and generated gas and water vapor are extracted to the outside of the treatment tank.

[0031] Thus, during the drying step, it is desirable that the pressure in the treatment tank is reduced, and the emission of vapor is facilitated.

[0032] In this step, the reason why the matter to be treated is heated to a temperature not exceeding 135°C is to prevent the protein from denaturing. On the other hand, if the heating temperature is not more than 100°C, a long time is required for drying, which is uneconomical.

[0033] Thus, in this step, harmful insects and pathogenic organisms in the garbage die, so that a clean compost can be obtained.

[0034] Incidentally, when the organic matters to be treated are only ones containing a large amount of oil such as, for example, bony parts of fishery products and the like, it is necessary to boil them beforehand to remove the oil content. However, even in the case of such garbage of high oil and fat content, when leftover food and vegetable containing no oil are mixed in approximately equal amounts, the degreasing treatment is unnecessary.

[0035] In addition, it is desirable that thick bones of animals, wooden waste materials, bulky waste and the like are ground into suitable sizes beforehand.

[0036] The compost obtained by such treatment has a nature as shown in Table 1.

[0037] However, in Table 1:

fishery products are fishery products having low fat and oil content;
leftover food A includes only rice food; and
leftover food B includes (60% of vegetable containing no oil) + (40% of fishery products containing oil).

Table 1

Cross-reference between Material and Nature of Compost	
Material	Nature of Compost
Leaf vegetable	dried pale brown soil
Fishery products thickness	fine back brown granule slightly having slight adhesion

Table 1 (continued)

Cross-reference between Material and Nature of Compost	
Material	Nature of Compost
Leftover food A	soil-colored granules mixture from lump of size of about golf ball to powder state
Leftover food B	dried and soil-colored fine powder
Carbohydrate	arid soil powder

[0038] In addition, the water vapor generated in the treatment tank contains more or less offensive odor components, so that a deodorization treatment thereof is necessary.

[0039] Thus, the construction is made such that the water vapor containing the odor generated in the treatment tank is sucked to the outside by means of a suitable unit to recovery as water it by washing it, and have the odor component absorb by water, only odorless components are released to the outside, and polluted water is subjected to an aeration treatment to reutilize.

[0040] Incidentally, the odors of onion and garlic are difficult to treat by means of the method of vapor, so that it is recommended that they are treated by an ozone decomposition method and the like and released to atmospheric air.

[0041] Details of the present invention will be explained with reference to the drawing.

[0042] Fig. 1 is an explanatory view showing one embodiment of a composter according to the present invention.

[0043] In the figure, 1 is a garbage treatment tank provided with a heat medium jacket, 2 is a lid thereof, 3 is a rotary vane, 4 is an axial disk like pulsator, 5 is a motor, 6 is a humidity meter, 7 is a temperature detector, 8 is a heat medium, 9 is a heat pump, 10 is a controller of the heat pump, 11 is a temperature detector for the heat medium, 12 is a water reserving tank, 13 is a water circulating pump, 14 is an exhaust ejector for the treatment tank, 15 is an ejector for circulating the gas in the water reserving tank, 16 is an air pump for aeration, 17 is an air stone (porous pipe) for aeration, 18 is a deodorizing unit, 19 is a control panel, 20 is a ventilation control valve, and 21 is a garbage to be treated.

[0044] The garbage treatment tank I is a cylindrical vessel provided with the jacket for accommodating and circulating the heat medium 8 such as oil or the like, which has a ventilation tube and an exhaust tube communicating with the outside air, and is closed by the lid 2 air-tightly. Further, although not shown in the figure, it has a takeout port for a treated compost at a lower portion of its body portion and a door for closing it airtightly manner, and the rotary vane 3 and the pulsator 4 are provided at the interior thereof rotatably about a central axis.

[0045] As for the heat medium 8 its temperature is adapted to be controlled sequentially by means of the heat pump 9 and its controller 10 in accordance with a predetermined program depending on the water content, temperature and the like of the contents in the garbage treatment tank 1, and the heat medium is circulated in the jacket la of the garbage treatment tank 1 by a circulating pump built-in the heat pump 9, so that the garbage 21 is heated by the heat medium 8.

[0046] The pulsator 4 in the garbage treatment tank 1 is provided coming into contact with the bottom surface of the tank, the rotary vane 3 is provided above it coaxially with the pulsator 4, and any one of which can be rotated by the motor 5.

[0047] It is desirable to constitute the pulsator so that the pulsator 4 splashes the garbage 21 from the center of the treatment tank 1 toward the outside, and the rotary vane 3 grinds the splashed garbage 21 and clips off it from an inner wall surface of the garbage treatment tank I and it can be put back to the central axis direction.

[0048] In addition, although the rotary vane 3 and the pulsator 4 are driven by one common shaft in the figure, it is also recommended that, for example, a duplex tube shaft or the like may be used to drive them independently with each other.

[0049] Anyway, by using the rotary vane 3 and the pulsator 4, the garbage 21 having a high water content is ground, heated and made into a rice porridge state.

[0050] The heat pump 9 and the heat pump controller 10 have the heat medium 8 in the heat medium jacket of the treatment tank 1 circulate while performing sequence control within a temperature range from 40°C to 135°C in accordance with a degree of proceeding of drying of the contents in the treatment tank.

[0051] The heat medium 8 is heated to a predetermined temperature from 70°C to 135°C, preferably about 75°C to 80°C, thereby the garbage 21 is also slowly heated from room temperature to 65°C, evaporation of water content is performed, and the temperature is raised exceeding 65°C.

[0052] When the water content of the contents in the treatment tank I is lowered, provided that the temperature difference with respect to the heat medium is constant, the temperature rising speed of the contents gradually becomes fast.

[0053] Incidentally, during this step, it is recommended that the ventilation control valve 20 is narrowed down, by having the exhaust ejector 14 for the treatment tank described below operate to lower the internal pressure in the treatment tank 1, so as to facilitate evaporation of water content.

[0054] Because the generated vapor has a considerable offensive odor, the deodorization thereof is necessary.

[0055] Thus, the water reserving tank 12 is provided, water in the water reserving tank 12 is supplied to the ejector 14 by the water circulating pump 13, the vapor at an upper portion in the garbage treatment tank 1 is sucked to be guided to the inside of the water reserving tank 12 and absorbed by water, then outside air is sucked by the air pump 16 and supplied to the air stone 17 provided at a lower portion in the water reserving tank 12, and the aeration is performed to decompose offensive odor components absorbed in water by means of aerobic bacteria.

[0056] Incidentally, buffers 12a, 12b are provided in the water reserving tank 12.

[0057] Further, a part of gas at an upper portion in the water reserving tank 12 is sucked by the ejector 15 for circulating the gas in the water reserving tank, which is returned into water in the water reserving tank 12 again, however, excessive gas is released to atmospheric air through the deodorizing unit 18 filled with an absorbing agent.

[0058] When dehydration and drying of the contents in the garbage treatment tank 1 proceed, and the water content lowers to a predetermined value, desirably about 30-10%, then the composting is completed.

[0059] Thus, according to the present invention, the composting completes in about 3 hours in the case of the apparatus having the throughput of 2.5 kg used for garbage treatment for homes, about 6 hours in the case of the one of 100 kg, and about 12 hours in the case of the one of 2500 kg in large size.

[0060] The compositions of composts produced by the method of the present invention using various raw materials are shown in Table 2. According to this table, it is known that the composts produced by the method of the present invention have excellent compositions as soil improving agents.

Table 2

Item	Composition (total amount %)				
	Nitrogen	Phosphorus	Potassium	Lime	Magnesia
Raw material					
Fish bony parts	6.85	2.39	1.12	1.95	0.39
Leftover food	2.65	1.45	0.29	0.21	0.48
Bean curd lees	4.21	0.75	0.59	0.27	0.25
Sludge	3.12	1.75	0.47	0.25	0.45

[0061] The present invention is constituted as described above, therefore, according to the present invention, it is possible to efficiently dehydrate, ferment, dry and compost garbage and the like having a high water content.

Claims

1. A method for composting organic matters having a high water content, comprising:

   a fermentation and decomposition step in which said organic matters are held in a treatment tank under supply of air from one hour to three hours at a temperature from room temperature to 60°C while heating, agitating and grinding them in order to perform an aerobic fermentation, and generated gas and water vapor are extracted to the outside of the treatment tank to perform dehydration and drying of the product into a water content of not more than 65%;
   a thermal fermentation and decomposition step in which the temperature of the fermentation and decomposition product is held from one hour to six hours at a temperature from 60°C to 100°C to thermally decompose the fermentation and decomposition product, and generated gas and water vapor are extracted to the outside of the treatment tank to perform dehydration and drying of the product into a water content of not more than 45%; and a final drying step in which a temperature of the thermal decomposition product is held from one hour to six hours at a temperature from 100°C to 135°C to perform sterilization, and generated gas and water vapor are extracted to the outside of the treatment tank to perform dehydration and drying of the product into a water content of not more than 30%.

2. A method for composting organic matters having a high water content according to claim 1, wherein the organic matters to be treated have an initial water content from 80 % to 98 %.

3. An apparatus for decomposing, drying and composting organic matters having water content, comprising:

   a treatment tank (1) having a heat medium jacket provided to cover a main body portion, an introduction port

for organic matters to be treated, a lid (2) capable of closing the introduction port for organic matters air-tightly, a compost takeout port, a door capable of closing the compost takeout port air tightly, a ventilation tube provided with a ventilation control valve (20) and capable of introducing outside air into the inside of the treatment tank (1), and an exhaust tube capable of extracting internal gas to the outside;
a unit (9) for circulating a heat medium (8) in the heat medium jacket of the treatment tank (1) while sequentially controlling it in a temperature range from room temperature to 135°C in accordance with a proceeding degree of drying of contents in the treatment tank; a rotary vane (3) which rotates in the treatment tank (1), grinds and agitates organic matters (21) to be treated in the treatment tank; a unit (5) for rotating the rotary vane (3); units (12, 13, 14, 15, 16, 17, 18) including a water tank for extracting the gas generated in the treatment tank (1) through its exhaust tube to the outside of the treatment tank (1) and performing a deodorization treatment to release it to atmospheric air; and a unit (19) for controlling the operation of each of said composing elements,

characterized in that treatment tank (1):

- is cylindrical and vertically disposed in such a way that said lid is the upper basis of the cylinder;
- said heat medium (8) being a liquid, which circulates within a jacket, surrounding the bottom and side surfaces of said cylindrical container (1);
- said rotary vane (3) having its shaft vertical and passing axially from the bottom of said treatment tank (1) the respective motor (5) being placed below and outside;
  below said rotary vane (3) and on the bottom of said treatment tank (1) and inside it, an axial disk like pulsator (4) is placed;
- the water tank (12) being located beneath said treatment tank (1).

Patentansprüche

1. Methode zum Kompostieren organischer Stoffe mit einem hohen Wasserinhalt, mit:

   einem Gärungs- und Zersetzungsschritt, in welchem besagte organischen Stoffe in einem Behandlungstank unter Luftzufuhr eine bis drei Stunden lang auf einer Temperatur von der Raumtemperatur bis 60°C gehalten und dabei erwärmt, geschüttelt und zermahlen werden, um eine aerobische Gärung durchzuführen, und das erzeugte Gas und der Wasserdampf aus dem Behandlungstank abgeführt werden, zur Wasserentziehung und Trocknung des Produkts auf einen Wassergehalt von nicht mehr als 65 %;
   einen Wärmegärungs- und Zersetzungsschritt, in welchem die Temperatur des Gärungs- und Zersetzungsprodukts eine Stunde bis sechs Stunden lang auf einer Temperatur von 60°C bis 100°C gehalten wird, um das Gärungs- und Zersetzungsprodukt thermal zu zersetzen, und das erzeugte Gas und der Wasserdampf aus dem Behandlungstank abgeführt werden, zur Wasserentziehung und Trocknung des Produkts auf einen Wassergehalt von nicht mehr als 45 %; und einen Endtrocknungsschritt, in welchem eine Temperatur des Wärmezersetzungs-Produkts eine bis sechs Stunden lang auf einer Temperatur von 100°C bis 135°C gehalten wird, um die Sterilisierung durchzuführen, und das erzeugte Gas und der Wasserdampf aus dem Behandlungstank abgeführt werden, zur Wasserentziehung und Trocknung des Produkts auf einen Wassergehalt von nicht mehr als 30 %.

2. Methode zum Kompostieren organischer Stoffe mit einem hohen Wassergehalt nach Anspruch 1, wobei die zu behandelnden organischen Stoffe einen anfänglichen Wassergehalt von 80 % zu 98 % haben.

3. Vorrichtung zum Zersetzen, Trocknen und Kompostieren organischer Stoffe mit Wassergehalt, mit:

   einem Behandlungstank (1) mit einer Wärmmittelumhüllung, die ein Teilstück des Hauptkörpers bedeckt, eine Zufuhröffnung für zu behandelnde organische Stoffe, einen Deckel (2), der die Zufuhröffnung für organische Substanzen luftdicht abschließen kann, eine Kompost-Entnahmeöffnung, eine Tür, die die Entnahmeöffnung luftdicht abschließt, ein Belüftungsrohr mit einem Belüftungskontroll-Ventil (20), das Außenluft in das Innere des Behandlungstanks (1) einführt, und ein Auslaßrohr, das das innere Gas nach außen abführt;
   eine Einheit (9) zur Inumlaufsetzung eines Wärmmittels (8) in der Wärmmittelumhüllung des Behandlungstanks (1), während es sequentiell in einem Temperaturbereich von der Raumtemperatur bis 135°C kontrolliert wird bei steigendem Trockengrad des Inhalts des Behandlungstanks; eine Drehschaufel (3), die in dem Behandlungstank (1) rotiert und die in dem Behandlungstank zu behandelnden organischen Stoffe zermahlt und schüttelt (21); eine Einheit (5) zum Drehen der Drehschaufel (3); Einheiten (12, 13, 14, 15, 16, 17, 18) ein-

schließlich eines Wassertanks zum Abführen des in dem Behandlungstank (1) erzeugten Gases durch sein Auslaßrohr nach außerhalb des Behandlungstanks (1) und zur Desodorisierung zwecks dessen Freigabe an die Außenluft; und eine Einheit (19) zur Kontrolle der Funktion jedes der besagten Bestandteile,

gekennzeichnet dadurch, daß dieser Behandlungstank (1):

- zylindrisch und senkrecht angeordnet ist, derart, daß besagter Deckel die obere Basis des Zylinders ist;
- besagtes Wärmmittel (8), das innerhalb einer Umhüllung zirkuliert, die Boden- und Seitenoberflächen von besagtem zylindrischen Behälter (1) umgibt;
- besagte Drehschaufel (3) eine senkrechte Welle hat und axial von dem Boden von besagtem Behandlungstank (1) ausgeht, wobei der betreffende Motor (5) unterhalb und außerhalb angeordnet ist;
  unterhalb besagter Drehschaufel (3) und auf dem Boden von besagtem Behandlungstank (1) und in diesem eine axialer scheibenförmiger Pulsator (4) angebracht ist;
- der Wassertank (12) unterhalb besagten Behandlungstanks (1) plaziert ist.

Revendications

1. Méthode pour le compostage de substances organiques ayant un contenu élevé d'eau, comprenant:

   une phase de fermentation et de décomposition dans laquelle lesdites substances organiques sont tenues dans un récipient de traitement avec alimentation d'air d'une heure à trois heures à une température qui s'étend de la température ambiante jusqu'à 60°C en les chauffant, agitant et moulant afin d'effectuer une fermentation aérobique, et le gaz généré et la vapeur d'eau sont extraits du récipient de traitement pour effectuer la déshydratation et le séchage du produit pour obtenir un contenu d'eau qui n'excède pas 65%;
   une phase de fermentation thermale et de décomposition dans laquelle la température du produit de la fermentation et de la décomposition est tenue pour une heure jusqu'à six heures à une température de 60°C à 100°C pour décomposer thermalement le produit de fermentation et de décomposition, et le gaz généré et la vapeur d'eau sont extraits hors du récipient de traitement pour effectuer la déshydratation et le séchage du produit pour obtenir un contenu d'eau qui n'excède pas 45%; et une phase de séchage final dans laquelle une température du produit de la décomposition thermale est tenue pour une heure jusqu'à six heures à une température de 100°C à 135°C pour effectuer la stérilisation, et le gaz généré et la vapeur d'eau sont extraits hors du récipient de traitement pour effectuer la déshydratation et le séchage du produit pour obtenir un contenu d'eau qui n'excède pas 30%.

2. Méthode pour le compostage de substances organiques ayant un contenu élevé d'eau selon la revendication 1, dans lequel les substances organiques à traiter ont un contenu d'eau initial de 80 % à 98 %.

3. Un appareil pour décomposer, sécher et composter des substances organiques ayant un contenu d'eau, comprenant:

   un récipient de traitement (1) ayant une enveloppe de moyen de chaleur pour couvrir une portion de corps principale, une porte d'introduction pour les substances organiques à traiter, un couvercle (2) capable de fermer la porte d' introduction pour substances organiques de manière imperméable à l'air, une porte de prélèvement de compost, une porte capable de fermer la porte de prélèvement de manière imperméable à l'air, un tuyau de ventilation pourvu d'une valve de contrôle de ventilation (20) et capable d'introduire de l'air du dehors dans l'intérieur du récipient de traitement (1), et un tuyau d'échappement capable d'extraire le gaz interne vers l'extérieur;
   une unité (9) pour faire circuler un moyen de chaleur (8) dans l'enveloppe de moyen de chaleur du récipient de traitement (1) et pour le contrôler en même temps séquentiellement dans un écart de température de la température ambiante à 135°C en correspondance avec un degré progressif de séchage du contenu dans le récipient de traitement; une girouette rotatoire (3) qui tourne dans le récipient de traitement (1), moud et agite des substances organiques (21) à traiter dans le récipient de traitement; une unité (5) pour faire tourner la girouette rotatoire (3); des unités (12, 13, 14, 15, 16, 17, 18) incluant un récipient d'eau pour extraire le gaz généré dans le récipient de traitement (1) à travers son tuyau d'échappement vers l'extérieur du récipient de traitement (1) et pour effectuer un traitement de déodorisation pour le relâcher à l'air atmosphérique; et une unité (19) pour contrôler l'opération de chacun desdits éléments de composition,

caractérisé en ce que ce récipient de traitement (1):

- est cylindrique et disposé verticalement de façon à ce que ledit couvercle est la base supérieure du cylindre;
- ledit moyen de chauffage (8), lequel circule dans un enveloppe, entoure les surfaces de base et de côté dudit conteneur cylindrique (1);
- ladite girouette rotatoire (3) ayant un arbre vertical et passant axialement de la base dudit récipient de traitement (1), le moteur respectif (5) étant placé au-dessous et dehors;
  au-dessous de ladite girouette rotatoire (3) et sur la base dudit récipient de traitement (1) et dans celui-ci, un pulsateur axial en forme de disque est placé(4);
- le récipient d'eau (12) étant localisé au-dessous dudit récipient de traitement (1).

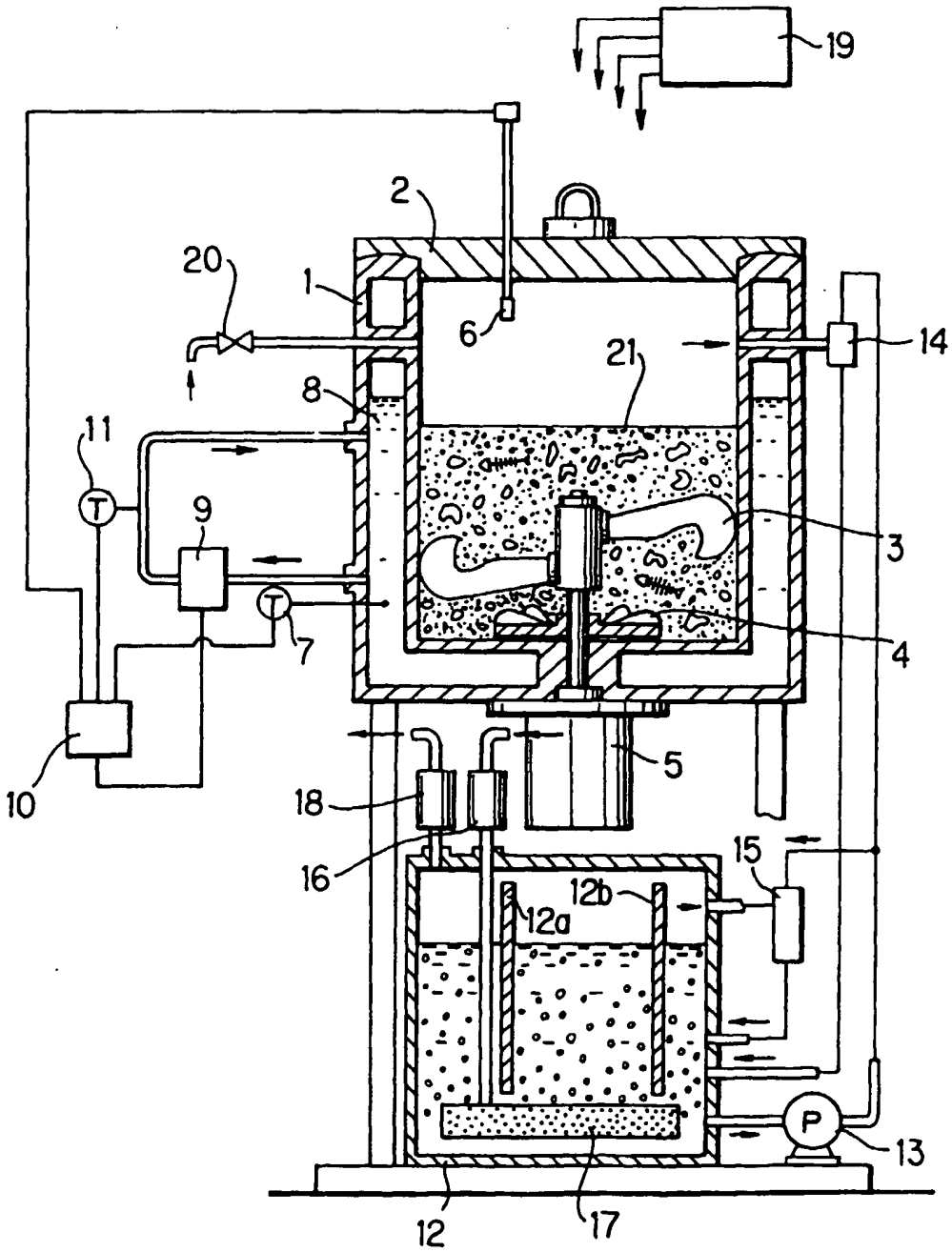

Fig. 1